

F04D

NON-POSITIVE DISPLACEMENT PUMPS

Definition statement

This place covers:

Non positive displacement pumps for liquids, for elastic fluids, or for liquids and elastic fluids, whether rotary or not having pure rotation.

References

Limiting references

This place does not cover:

Aeroplane propellers	B64C 11/00
Non positive displacement machines or engines	F01D
Machines or engines for liquids	F03B
Wind motors	F03D
Combinations of non-positive displacement pumps with other pumps; Positive displacement machines for fluids Pumps	F04B
Rotary-piston, or oscillating piston, positive displacement machines for fluids	F04C

Informative references

Attention is drawn to the following places, which may be of interest for search:

Blood pumps	A61M 1/00
Obtaining oil, gas, water from deep wells	E21B
Pumping cooling air or liquid coolants	F01P 5/00
Bearings	F16C
Sealings	F16J 15/00
Central heating systems	F24D
Air conditioning, Ventilation	F24F

Special rules of classification

As a general rule a complete classification will contain at least one class out of the 2 first main parts which would specify the type of pump concerned, combined with at least one class out of the main group [F04D 29/00](#).

In cases where a "Details, component, parts, or accessories" has to be classified which can be used in a number of different types of pumps which would be covered by different sub groups, only the relevant [F04D 29/00](#) sub group class should be given.

Care should be taken when classifying compressors used in combination with gas turbines. Classification in [F04D](#) when compressor details are predominant. Classification in [F01D](#) when the integration or the fluid connection to the turbine or its combustion chamber are involved

This subclass is generally subdivided in 3 main parts:

- Non-positive displacement pumps for non-elastic fluids: [F04D 1/00](#) - [F04D 15/029](#)

- Non positive displacement pumps for elastic fluids: [F04D 17/00-F04D 27/0292](#)
- Details, component, parts, or accessories: [F04D 29/00](#) - [F04D 29/708](#)

In the part related to "Details, component, parts, or accessories" i.e. main group [F04D 29/00](#) each sub group is subdivided in two further subgroups, one for elastic fluids and another one for non elastic fluids. By way of example: [F04D 29/02](#) has a subgroup [F04D 29/023](#) covering the elastic fluids, and another subgroup [F04D 29/026](#) covering the non elastic fluids.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Engine	means a device for continuously converting fluid energy into mechanical power. Thus, this term includes, for example, steam piston engines or steam turbines, per se, or internal-combustion piston engines, but it excludes single-stroke devices
Pump	means a device for continuously raising, forcing, compressing, or exhausting fluid by mechanical or other means. Thus, this term includes fans or blowers
Machine	means a device which could equally be an engine and a pump, and not a device which is restricted to an engine or one which is restricted to a pump
Positive displacement	means the way the energy of a working fluid is transformed into mechanical energy, in which variations of volume created by the working fluid in a working chamber produce equivalent displacements of the mechanical member transmitting the energy
Non-positive displacement	means the way the energy of a working fluid is transformed into mechanical energy, by transformation of the energy of the working fluid into kinetic energy, and vice versa
Rotary-piston machine	means a positive-displacement machine in which a fluid-engaging work-transmitting member rotates about a fixed axis or about an axis moving along a circular or similar orbit. This definition applies also to engines and pumps

F04D 1/00

Radial-flow pumps, e.g. centrifugal pumps; Helico-centrifugal pumps (adapted for pumping specific fluids [F04D 7/00](#); priming or boosting [F04D 9/00](#))

Definition statement

This place covers:

Radial and mixed flow type pumps for non elastic fluids

References

Limiting references

This place does not cover:

Shear force pumps	F04D 5/001
Adaptation to specific liquids	F04D 7/00
Priming of pumps	F04D 9/00

Synonyms and Keywords

In patent documents the following expressions/words "helico centrifugal flow", "mixed flow" and "diagonal flow" are often used.

F04D 3/00

Axial-flow pumps (priming or boosting [F04D 9/00](#))

Definition statement

This place covers:

Axial flow type pumps for non elastic fluids.

References

Limiting references

This place does not cover:

Adaptation to specific liquids	F04D 7/00
Priming of pumps	F04D 9/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conveyors	B65G 33/00
Archimedes screw pumps	F04B 19/12

F04D 5/00

Pumps with circumferential or transverse flow {(control thereof [F04D 15/005](#))}

Definition statement

This place covers:

Shear force pumps and pumps with circumferential or transverse flow, also shear force pumps, although they are generally of radial type.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Shear force pump	a pump where the energy is transferred to the liquid by friction forces
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Synonyms and Keywords

In patent documents the following expressions/words "circumferential flow pump", "side channel pump", "regenerative pump", "peripheral flow pump" and "vortex flow pump" are often used.

F04D 7/00

Pumps adapted for handling specific fluids, e.g. by selection of specific materials for pumps or pump parts ([F04D 11/005](#), [F04D 29/22](#) take precedence)

Definition statement

This place covers:

Adaptations which make a pump suitable for a specific liquid.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Pumping specific fluids in general	F04B 15/00
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Special rules of classification

In general classification is combined with a sub group in the [F04D 29/00](#) group

F04D 9/00**Priming; Preventing vapour lock****Definition statement**

This place covers:

All adaptations of a pump in order to prime the pump, to avoid vapor lock or to avoid loss of prime

F04D 11/00

Other rotary non-positive-displacement pumps (pumping installations or systems [F04D 13/00](#))

Definition statement

This place covers:

Any rotary non-positive displacement which does not have radial, axial or helico centrifugal flow.

F04D 13/00

Pumping installations or systems (controlling [F04D 15/00](#))

Definition statement

This place covers:

The combination of a pump with its drive system or its integration into a system either comprising several pumps or comprising storage systems

References**Limiting references**

This place does not cover:

Control of pumps	F04D 15/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Electrical machines	H02K
Magnetic couplings	H02K 49/102

F04D 15/00

Control, e.g. regulation, of pumps, pumping installations or systems

Definition statement

This place covers:

Systems and schemes for controlling a pump, either matching the pump to the requirements of the system or avoiding harmful conditions for the pump

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Actuators for control action	F04D 29/00
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F04D 17/00

Radial-flow pumps, e.g. centrifugal pumps; Helico-centrifugal pumps
([F04D 21/00](#) takes precedence)

Definition statement

This place covers:

Radial and mixed-flow type pumps for elastic fluids.

Special rules of classification

The centrifugal pumps for elastic fluids are subdivided into 2 main parts; in the "compressing or evacuating" sub group [F04D 17/10](#) the compression ratio should be significant, while in the "for displacing without appreciable compression" sub group [F04D 17/16](#) the generation of flow is predominant

Synonyms and Keywords

In patent documents the following expressions/words "helico centrifugal flow", "mixed flow" and "diagonal flow" are often used.

F04D 19/00

Axial-flow pumps ([F04D 21/00](#) takes precedence; {pump comprising axial flow and radial flow stages [F04D 17/025](#)})

Definition statement

This place covers:

Axial flow type pumps for elastic fluids.

References

Limiting references

This place does not cover:

Combined axial-flow and radial-flow stages	F04D 17/025
Pumps involving supersonic speeds in the pumped fluid	F04D 21/00

Special rules of classification

The axial pumps for elastic fluids are subdivided into 2 main parts; in the "multistage pumps" sub group [F04D 19/02](#) the compression ratio should be significant, while in the "fan" sub groups [F04D 19/002](#) and [F04D 19/007](#) the generation of flow is predominant

F04D 21/00

Pump involving supersonic speed of pumped fluids

Definition statement

This place covers:

All pump for elastic fluids involving supersonic speed of pumped fluids.

F04D 23/00

Other rotary non-positive-displacement pumps (pumping installations or systems [F04D 25/00](#))

Definition statement

This place covers:

Any rotary non positive displacement which does not have radial, axial or helico centrifugal flow, pumps adapted for conveying or for handling specific elastic fluid, and pumps with circumferential or transverse flow.

F04D 25/00

Pumping installations or systems (controlling [F04D 27/00](#))

Definition statement

This place covers:

The combination of a pump for elastic fluids with its drive system or its integration into a system either comprising several pumps or comprising storage systems.

References

Limiting references

This place does not cover:

Pump installation control	F04D 27/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Hand held fans	A45B
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Special rules of classification

[F04D 25/06](#) and [F04D 25/08](#) are both used in parallel . [F04D 25/06](#) focusses on the motor design, or the combination of motor and pump. [F04D 25/08](#) focusses on specific design for special purposes. Both subgroups can be used in combination (e.g. a computer fan with an inside out motor and details on how the motor is cooled will get both [F04D 25/0613](#) and [F04D 25/082](#) classification

F04D 27/00**Control, e.g. regulation, of pumps, pumping installations or systems****Definition statement**

This place covers:

Systems and schemes for controlling a pump for elastic fluids, either matching the pump to the requirements of the system or avoiding harmful conditions for the pump, e.g. surge or stall conditions.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Control of flow	G05D 7/00
Control of pressure	G05D 16/00

Special rules of classification

[F04D 27/02](#) subgroup is used for ANY type of control and is thus not limited to surge or stall control

[F04D 27/001](#) is used when the detection of pump condition is predominant (e.g. determining of surge margin, without immediate control action; mapping of pump characteristics for later use)

F04D 29/00**Details, component parts, or accessories (machine elements in general [F16](#))****Definition statement**

This place covers:

Details, component parts, or accessories of any type of pump for elastic or non elastic fluids.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Making blades for propellers or turbines	B21D 53/78
Making specific metal objects	B23P 15/00
Machine elements in general	F16

Special rules of classification

In main group [F04D 29/00](#) each sub group is subdivided in two further subgroups, one for elastic fluids and another one for non elastic fluids. By way of example: [F04D 29/02](#) has a subgroup [F04D 29/023](#) covering the elastic fluids, and another subgroup [F04D 29/026](#) covering the non elastic fluids.

However for the subgroups relating to bearing and shafts ([F04D 29/04](#) and [F04D 29/05](#)) and rotors ([F04D 29/18](#) and [F04D 29/26](#)) specific subgroups are provided for elastic fluids and non-elastic fluids.

F04D 31/00

Pumping liquids and elastic fluids at the same time

Definition statement

This place covers:

Pumping liquids and elastic fluids at the same time, i.e. one pump handles both elastic and non elastic fluids together.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining oil, gas, water from deep wells	E21B
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F04D 33/00

Non-positive-displacement pumps with other than pure rotation, e.g. of oscillating type ([F04D 35/00](#) takes precedence; hand-held fans [A45B](#))

Definition statement

This place covers:

Non-positive-displacement pumps with other than pure rotation. Some examples are mechanisms imitating the movement of a bird wing or a fish tale, or the movement produced by humans when using a hand fan.

References

Limiting references

This place does not cover:

Wave generators	F04D 35/00
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F04D 35/00

Pumps producing waves in liquids, i.e. wave.producers (for bath tubs [A47K 3/10](#))

Definition statement

This place covers:

Non-positive-displacement pumps for the generation of waves.

References***Limiting references***

This place does not cover:

Wave generators for baths and tubs	A47K 3/10
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Swimming pools	E04H 4/00
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